

Photo: *The 1924 Trail Gang in the Flume*, Courtesy of the Appalachian Mountain Club.

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bstract

The Missoula Technology and Development Center (MTDC), working with trail crews throughout the United States, has standardized a comprehensive document on the use and maintenance of handtools involved in trail work. Information collected from industry experts, from interviews with trail crew members, and from extensive

literature and market research on the subject provides the text for this document. It stresses safe and efficient tool use. It describes each tool and presents nomenclature and maintenance procedures, including sharpening techniques and rehandling methods. The document is intended for both experienced and inexperienced trail crews.

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bout This Document

The tools shown here are those used most often by Forest Service trail crews. They are categorized into tools for sawing, chopping, grubbing, digging and tamping,

pounding and hammering, lifting and hauling, peeling and shaping, and sharpening and rehandling. Each tool is described along with helpful techniques for use and maintenance.



Introduction

Trail work requires many kinds of handtools like saws, axes, picks, hammers, shovels, and grub hoes. To be safe and productive, trail workers must know how to select the best tools for the job, use them skillfully, and maintain them correctly. However, modern technology has caused a gap in our handtool knowledge. Most trail tools have become uncommon in our everyday work world, which contributes to accidents, low productivity, and frustration.

This manual should help reduce accidents and increase production. It is intended for Forest Service employees, volunteers, and others who do trail work. It provides tips for using and maintaining common trail tools. Proper use and maintenance of handtools contributes to safe and efficient trail work and to a better trail system.

afe Trail Work

Keys to productive, safe, trail work are sharp tools, proper tool use, team work, and awareness of hazards. Such knowledge cannot come from a manual. Ask experienced crew members for help. Work as a team. Watch for hazards to other crew members. Alert each other to unsafe tools and hazards. Productive, safe crews depend on each member being alert, informed, and caring.

There are general safety rules to observe when using handtools. Survey the environmental hazards surrounding each task and use proper personal protective devices like hardhats, gloves, and safety glasses. Select the right tools for the job. Carefully inspect their condition before you use them. Make sure handles are sound, smooth, and straight; heads are tight; and cutting edges are sharp.

Avoid transporting tools loose in vehicles. Use tool boxes. Place tools in sheaths, especially if they have sharp cutting edges. Load and unload tools with care. Always use gloves. Pass tools so others avoid grasping a cutting edge. Never throw a tool.

Be aware of nearby workers. On the trail, carry tools by holding them at your side and downhill, with blades forward and the handles behind. If you should slip, drop the tool to the side to prevent falling on the blade. Designate a central drop point for tools near the worksite so tools are less likely to be lost. Mark handles with a small strip of bright orange paint for easy visibility.

You need training to use a crosscut saw. Your training, experience—and in some cases—level of certification, can allow you to buck trees already on the ground, or to undertake the more advanced (and hazardous) business of felling standing trees. Be sure you are properly trained and certified before cutting either standing or fallen trees. Remember that using an ax exposes you to similar hazards.

At day's end, identify tools that need maintenance and schedule time for repairing or replacing tools. In the field, store tools safely and out of the weather.



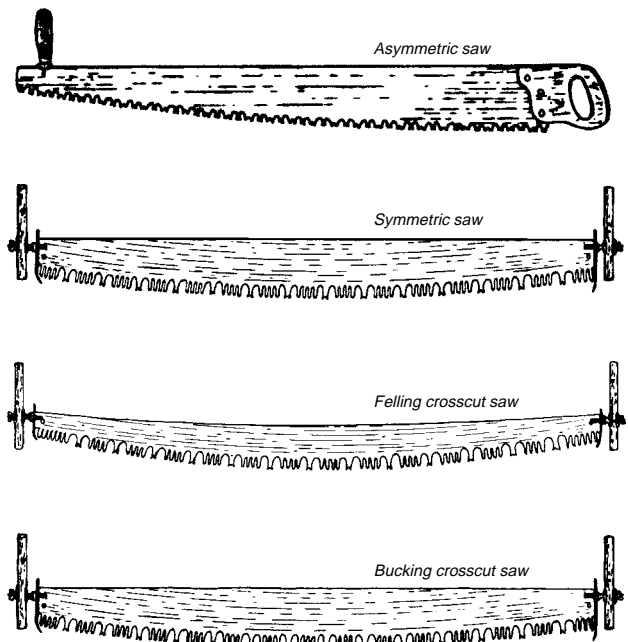
Tools for Sawing

Crosscut Saws

There are two types of crosscut saws. Symmetric crosscut saws are designed for a sawyer at each end, and asymmetric saws require only one sawyer. They are heavier so they can be pushed and pulled without buckling. There are two basic patterns for symmetric crosscuts—*felling crosscuts* are light, flexible, and have concave backs that conform easily to the arc of the cut and the sawyer's arm. The narrowed distance between the teeth and back helps sawyers wedge the cut quickly. Felling saws are usually preferred by trail crews. *Bucking crosscuts* have straight backs and are heavier and stiffer than felling saws. Their weight helps the saw cut faster and the stiffness prevents buckling on the push stroke when one person saws. Most asymmetric saws are bucking saws. Symmetric saws are pulled by each sawyer. There is no push stroke.

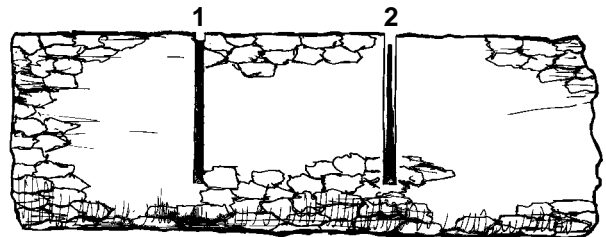


Crew members using a bucking crosscut saw.



Types of crosscut saws.

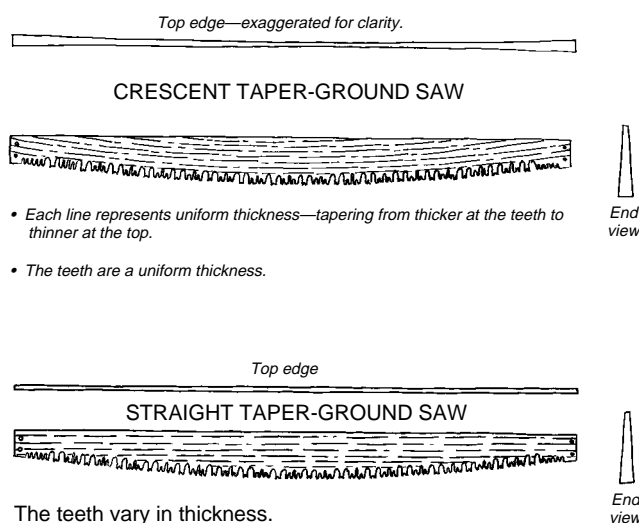
The points of most crosscut saw teeth lie on the arc of a circle. These cut easier than a straight-tooth saw and are almost as simple to maintain. Crosscut blades are ground *flat* or ground with a *taper* from front to back. A flat-ground blade displays uniform thickness throughout. Flat-ground saw teeth require more “set” than taper-ground saw teeth.



1—A cut made with flat-ground teeth tends to bind when cutting under compression.

2—A cut made by taper-ground teeth is less likely to bind.

Taper-ground saws vary from thick-at-the-teeth to thin-at-the-back so their teeth require less set. Taper-ground saws work well for trail jobs because they begin cuts quickly and are slower to bind than flat-ground saws. For all-around trail use, a taper-ground felling crosscut is very effective. Taper-ground saws are often called *crescent*, *precision*, *segment*, or *arc-ground* saws.



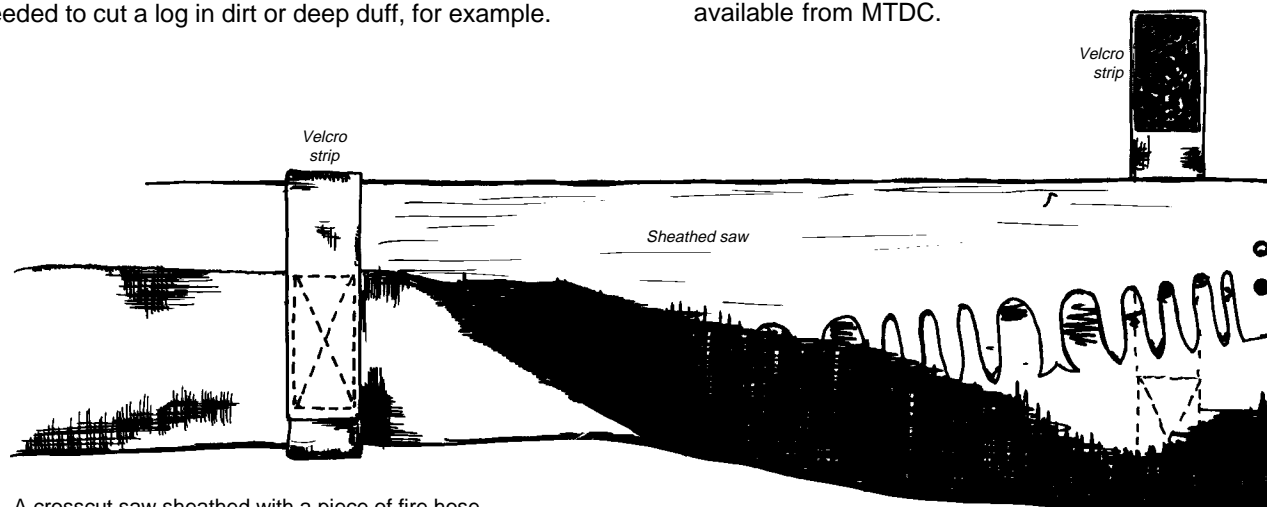
One-person saw blades vary from 3 to 4½ feet and these saws weigh 4 to 5 pounds. Two-person saws generally have 6-foot blades and weigh about 8 pounds.

Many modern crosscuts have solid ends. That is, the teeth do not extend to the ends of the blade. For finishing some cuts, however, you will often need a saw with teeth continuous to both ends. A saw with continuous teeth is needed to cut a log in dirt or deep duff, for example.

Before sawing a log with a crosscut, “swamp” the area to remove materials that could interfere with the cut. Next, check the “lay of the log” to determine what will happen when the cut is made. Saw from the uphill side unless you are placing an undercut on a standing tree. Remove loose bark from the line where the saw will pass. Avoid getting the saw into the dirt at the end of the cut. If necessary, place a piece of bark under the log or dig it free under the cut. Make final strokes with one end of the saw so only end teeth will dull if you slip.

When carrying a saw, lay it flat across one shoulder with the teeth guarded and facing away from the neck. Carry the saw on the downhill shoulder. Grasp the front handle from under the blade. Remove the rear handle to prevent snagging on overhanging limbs. Transport saws at the rear of a line of workers. Use blade guards made of sections of rubber-lined firehose slit lengthwise with Velcro fasteners to facilitate removal. Saws need extra protection when they are transported in a vehicle. They should be secured between pieces of plywood cut to blade width, or otherwise protected. Store saws straight. Either hang them or lay them flat. Storing saws in a bent position can bow the saw. Before storing, the blade should be coated with a protectant to prevent corrosion. Never store a saw in a wet sheath.

A sharp crosscut is a pleasure to operate, but a dull or incorrectly filed saw is a source of endless frustration. Quality crosscut saw filers are increasingly difficult to find. Good instruction for crosscut saw filing is still available, however. We recommend ***The Crosscut Saw Manual*** by Warren Miller (Technical Report 7771-2508-MTDC, June 1978). The manual discusses in detail how a saw works and offers experience-tested methods for choosing, using, and maintaining a saw. Copies are available from MTDC.



A crosscut saw sheathed with a piece of fire hose.

Tree sap may bind the crosscut blade in the cut. To prevent this, lightly lubricate the blade with a citrus-based solvent. If a flask is stoppered with a cork that has been grooved lengthwise, the blade can be evenly coated with a film of citrus-based solvent by inverting the flask and whisking the cork along the blade surface. An alternative would be a squirt bottle of citrus-based solvent that could spread a small stream of the fluid along the blade.

A leaning tree will have compressed fibers on its underside. In this case, a cut on that side could quickly bind a saw even after it has been undercut. If this happens, saw as much as possible, remove the saw, and chop away the severed wood. A down log can be under compression if it is only supported on the ends. A cut made in the middle will bind the saw as the weight of the log closes the kerf. Sometimes a cut can be continued by driving a wedge into the cut behind the saw. If the saw still binds, one sawyer should “underbuck” the log from the bottom. Remove one handle to reduce the chance of the blade “kinking” if the severed log carries it to the ground. Plant an ax in the log so the handle can support the back of the saw. Slightly notch the handle for a saw guide. Linseed oil in the notch allows the saw to run easily and minimizes handle wear. The flexible hickory holds the saw in the cut.

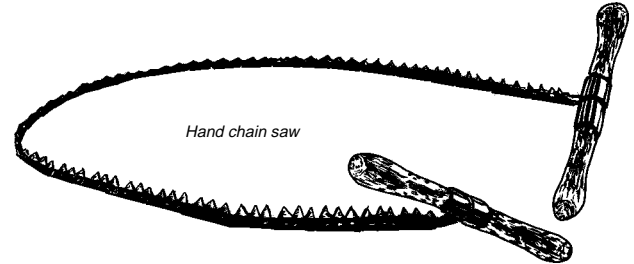
The cutting teeth of a crosscut saw sever the fibers on both sides of the kerf. The raker teeth cut like a plane, peel the fibers, and collect them in sawdust gullets between the teeth. From there they are carried out of the cut. A properly sharpened crosscut cuts deep and makes thick shavings.

Placement of the handles also determines how the saw cuts. For a vertical cut with the teeth pointing down and the handles up, the pull stroke will be easier the farther toward the end of the handle the hands are placed. Pointing the handles down reverses the situation. For saws that have two holes on each end, changing the handle position from the lower to the upper hole will have the same effect as moving the hands several inches up the handle.

Hand Chain Saws

The hand chain saw weighs only 2 pounds compared to 11 to 16 pounds for a conventional crosscut saw. The saw is equal in performance to a conventional crosscut saw for felling and superior for bucking. It is safer to carry and easier to pack.

Use and maintain this saw as you would use a crosscut saw.

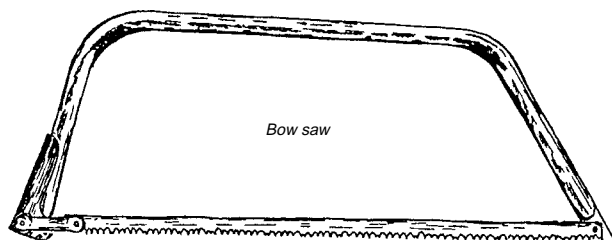


The hand chain saw performs equally as well as a conventional crosscut saw.

Bow Saws

Bow saws are useful for clearing small downfall and for limbing. Modern bow saws come in many sizes and consist of a tubular steel frame designed to accept replaceable blades. Blades detach by loosening a wing nut or releasing a throw clamp. The *clamp-type* saw does not require nuts and bolts that are easily lost. Unless spare nuts or bolts are carried along, the saw becomes useless. Blade lengths can vary from 16 inches to 36 inches. Saws weigh from 1 to 4 pounds. Let the saw do the work. Apply a little downward force with each stroke. When the bow saw is used for one sawyer, lean slightly over the frame and let your weight provide some downward pressure with each push of the blade. Forcing the blade into the cut may bind or break the blade. Use as much of the length of the blade as possible; the saw will cut smoother and stay sharp longer.

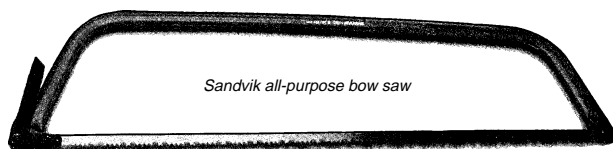
Although the bow saw is designed for one person, two people can saw large logs more effectively. Two people operate the bow saw like a crosscut—each works only on the pull stroke.



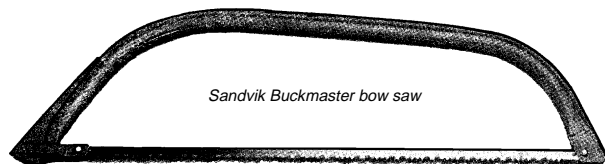
The teeth are needle-sharp, so wear gloves when sawing and keep hands clear of the cut and the blade. Carry bow saws by your side with the blade pointed down. Sheath the blade with small-diameter fire hose and Velcro fasteners or plastic blade guards when not in use. Always carry spare parts and plenty of replacement blades on the trail.

Since worn blades are replaced rather than sharpened, maintenance consists of blade replacement, periodic checks to see that bolts are tight, and an occasional light oiling. Take care when oiling these and other trail tools. Too much oil can trap dirt in tool joints.

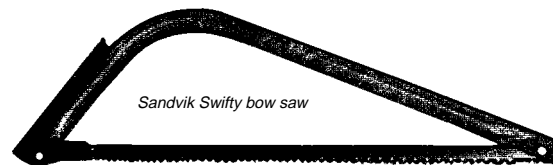
Examples:



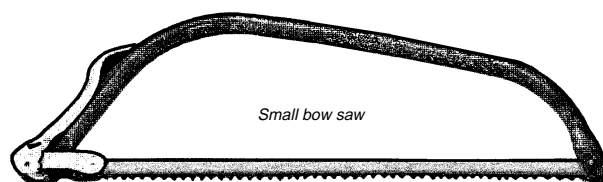
The Sandvik all-purpose bow saw has a hardened $\frac{3}{4}$ -inch by 36-inch blade, and a Swedish steel frame with a knuckle guard. The blade changes easily and has a tension lever. Its weight is $2\frac{1}{4}$ pounds.



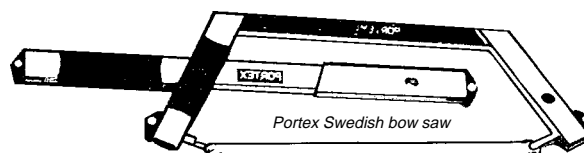
The Sandvik Buckmaster is used for heavy-duty bucking jobs. The precision $\frac{3}{4}$ -inch blade never needs refiling. The frame is Swedish oval tubing, with a knuckle guard and a tension lever for quick blade change. It weighs 3 to $3\frac{1}{2}$ pounds.



The Sandvik Swiftly is designed for light pruning and landscape work. The tension-mounted blade is $\frac{3}{4}$ inch wide and 21 inches long, and features a peg-tooth design. The quick-action tension lever facilitates blade changing. It has a Swedish steel frame with a knuckle guard, and weighs $1\frac{1}{4}$ pounds.



A small bow saw is used for pruning, limbing, landscaping, camping. The 21-inch raker tooth blade is quickly and easily replaced using a tension lever. The strong tubular steel frame is designed to allow use of the entire cutting blade. It weighs $1\frac{1}{2}$ pounds.



The Portex self-storing Swedish bow saw features a $\frac{3}{4}$ -by 16-inch Swedish steel blade with raker teeth for cutting firewood, limbs, or lumber. It has an aluminum frame with a no-slip, plastic hand grip. All parts disassemble and “nest” inside the handle, and are easy to reassemble. Weight is $1\frac{1}{4}$ pounds.



Bow saws effectively clear trails.